

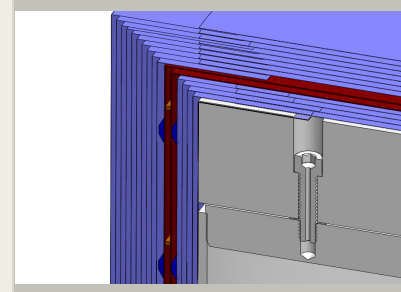
# Advanced Cooled Shield - Integrated MLI: Passive or Active Cooled System, Phase I

Completed Technology Project (2013 - 2013)



## Project Introduction

Cryogenic propellants are important to NASA's missions. Improvements in cryogenic propellant storage and transfer are critical to future long duration NASA spacecraft and missions. Advanced Cooled Shield - IMLI (ACS-IMLI) is an innovative ultra high performance system in which an Advanced Cooled Shield is fully integrated into the IMLI layer structure, reducing mass, forming a single robust system, with integrated cooled gas distribution in a cooled shield layer, eliminating heat flux through thermal shield tank standoffs or supports, and operable in both passive (vapor cooled shield) and active (broad area cooled shield) modes. NASA's TA-02 Roadmap calls "Zero Boil Off storage of cryogenic propellants for long duration missions" the #2 ranked technical challenge for NASA mission objectives and needs. Quest Thermal Group has developed IMLI, an advanced thermal insulation that uses proprietary discrete spacer technology to reduce heat flux. IMLI's unique structure is able to self support various loads, including a thin, lightweight vacuum shell for in-air operation, high strength ballistic layers for MMOD shielding, an external Broad Area Cooling Shield with cooling tubing, or an integrated thermal shield within the layers. IMLI's layer structure gives it unique capabilities, such as an embedded conductive, sealed thermal barrier. In this Phase I program, an ACS-IMLI system would be modeled, analyzed, designed, fabricated, installed on a cryotank, and tested for structural strength and thermal performance. Advanced Cooled Shield - IMLI (ACS-IMLI) could provide a lower mass, single insulation system, operable in both passive (vapor cooled) and active (cryocooled) modes, with 3 - 4X lower heat flux than IMLI alone. ACS-IMLI could help meet NASA's cryogenic fluid management requirements such as Zero Boil Off for cryogenic propellant storage and transfer.

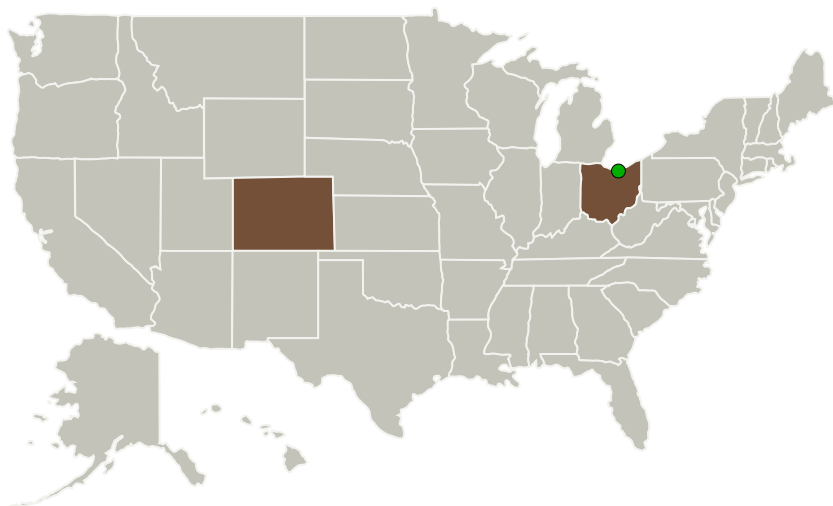


Advanced Cooled Shield - Integrated MLI: Passive or Active Cooled System

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Quest Thermal Group	Lead Organization	Industry	Arvada, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

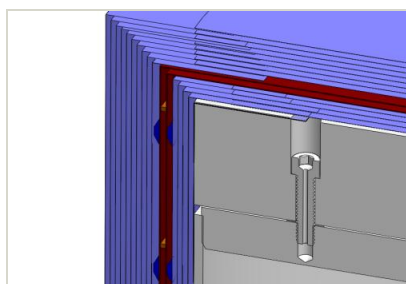
Primary U.S. Work Locations	
Colorado	Ohio

## Project Transitions

**May 2013:** Project Start**November 2013:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/137955>)

## Images

**Project Image**

Advanced Cooled Shield -  
Integrated MLI: Passive or Active  
Cooled System  
(<https://techport.nasa.gov/image/131495>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Quest Thermal Group

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

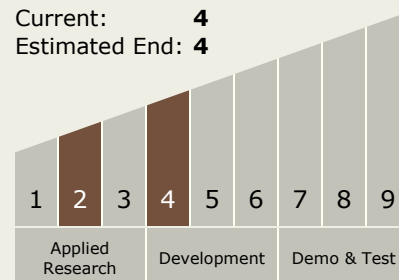
Carlos Torrez

**Principal Investigator:**

Scott A Dye

## Technology Maturity (TRL)

Start: 2  
Current: 4  
Estimated End: 4



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## Technology Areas

### Primary:

- TX14 Thermal Management Systems
  - └ TX14.3 Thermal Protection Components and Systems
    - └ TX14.3.2 Thermal Protection Systems

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System